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Resuscitator

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13 Claims

This invention relates to resuscitators.

As is known, a great number of fatalities occur due to suffocation caused by drowning accidents, electrocution and the like. In many such accidents, revival of the victim has been brought about by normal known methods of manual artificial respiration. However, in many cases, such methods have proved ineffective.

A still further method of artificial respiration which has been successfully employed is known as the "mouth-to-mouth" method. In this case, which is the oldest known method for reviving victims of asphyxiation, the mouth of the person applying the method is placed next to the mouth of the victim and air from the lungs of the former is physically blown into the victim's lungs. It has been found that the revival rate is as high, if not more so, than known manual forms of artificial respiration.

However, the "mouth-to-mouth" method has several disadvantages, firstly that whereas the person applying the method has no hesitation in intimate physical contact if the victim is a baby or a small child, there is a certain amount of diffidence when the victim is an adult. Secondly, in the case of a victim of a drowning accident, there is generally a considerable amount of mucus at the back of the victim's throat which must firstly be removed if successful respiration is to be accomplished and such removal presents difficulties.

Thus, the invention has for its object the provision of a simple and inexpensive resuscitating device for accomplishing "mouth-to-mouth" artificial respiration and simultaneously overcoming the above disadvantages.

Accordingly, this invention relates to a resuscitator comprising an air passage for blowing air into a patient's lungs, said passage being constituted by a primary tube and an oropharyngeal tube connected thereto, and at least one suction tube disposed at least in the oro-pharyngeal tube for removing mucus and secretions from the back of the patient's throat.

The invention is illustrated by way of example in the accompanying drawings in which:

Figure 1 is a sectional elevation of one form of the resuscitating device;

Figure 2 is a sectional elevation of an alternative form of the invention; and

Figure 3 is a transverse section taken on the line 3—3 of Figure 2;

Figures 4 to 8 are sectional elevations of still further embodiments of the invention; and

Figures 9 and 10 are detail views of a modified form f pressure-relieving valve.

Referring to the drawings, and in particular t Figure 1, it will be seen that the resuscitator comprises an air passage which is partly constituted by an oro-pharyngeal tube or pharyngeal airway 1, one end of which forms the proximal opening of the device, whereas the other end of said tube 1 is flexibly corrugated. The tube is provided, at one end thereof, with an occlusive mouth flap 2 and a bulbous portion 3. The air passage is further constituted by a primary tube 4 which is adapted to have one end slidden into the bulbous portion 3 of the airway 1.

A flexible suction tube 5 is coaxially disposed throughout the length of the device and projects a predetermined distance from the proximal opening, this end of the suction tube 5 being provided with a plurality of apertures 6 disposed about its periphery. The end of the suction tube 5 remote from the proximal end of the device, is provided with a cap 7 which serves to close the distal end of the device, and the suction tube 5 is coaxially disposed within said cap 7 and projects beyond the latter a predetermined amount where a suction bulb 8 is detachably secured thereto.

The operation of the type of resuscitator described in connection with Figure 1 is such that the victim is placed in the supine (face up) position and the mouth and throat cleared of any visible foreign matter. The tongue is brought forwardly from the back of the throat by the fingers or pulling on its tip.

Thereafter, the oro-pharyngeal tube 1 is inserted into the victim's mouth so that its proximal end lies behind and beyond the tongue. Any mucus, saliva or water is quickly aspirated from the throat, via the suction tube 5, by pressure alternately applied to the suction bulb 8. When the mucus has been sucked from the throat, the entire suction tube 5 is removed from the distal end of the device, together with its cap 7 and bulb 8, but it will be appreciated that the oro-pharyngeal tube 1 and attached tube 4 will still be in situ.

Thereafter, the victim is then turned into the prone position, lying on his abdomen with face down and to one side. The occlusive mouth flap 2 is then firmly fitted around the victim's mouth to prevent escape of air blown into the resuscitator thus allowing a more official level of air pressure to enter the victim's lungs. Also, and for the same reason, the victim's nose may be occluded with a clamp or with the fingers. As the mouth flap 2 is firmly applied, the victim's chin is brought forwardly.

The operator of the resuscitator then places himself at the head of the victim and turns the distal end of the primary tube 4 into a position where he can blow into it with ease and it will be appreciated that the flexible corrugated portion of the oro-pharyngeal tube 1 will permit relative movement between said tube and the primary tube 4 to permit blowing to occur from any convenient angle without danger of obstructing the air-way or permitting displacement of the oro-pharyngeal tube 1.

The operator then blows into the distal end of the primary tube 4 approximately 10 to 20 times a minute to effect complete resuscitation.

In the embodiment shown in Figures 2 and 3, it will be seen that the oro-pharyngeal tube 1 is provided with a secondary tube 9 integral therewith and extending throughout its length but the device is, in all other respects, similar to the device shown in Figure 1. The mode of operation of the device shown in Figures 2 and 3 is the same as that described above in connection with Figure 1 with the exception that after the mucus has been removed from the throat by means of the suction tube 5 and the latter has then been removed from the oro-pharyngeal tube 1 and primary tube 4, said tube 5 is then inserted into the secondary tube 9, this position of the suction tube 5 being indicated by the broken lines in Figure 2. This permits the oro-pharyngeal tube 1 and primary tube 4 to be entirely clear for blowing purposes but also ensures that the suction tube 5 will again be in situ

should further mucus form and collect in the throat and thus require removal by said tube 5. It will be noted that the longitudinal axis of the secondary tube 9 is parallel with the longitudinal axis of the oro-pharyngeal tube 1.

The embodiment shown in Figure 4 dispenses with the secondary tube 9 capable of receiving the suction tube 5 and instead has the latter formed integrally with the oro-pharyngeal tube 1. This embodiment ensures that a continuous air passage is formed by the oro-pharyngeal tube 1 and the primary tube 4 whilst ensuring that the suction tube 5 will always be in situ for operative purposes.

From Figure 5, it will be seen that a portion of the length of the suction tube 5 is formed integrally with the oro-pharyngeal tube and extends throughout a minor portion of the length of the latter.

The embodiment shown in Figure 6 incorporates a first suction tube 5 and a second suction tube 5' both of which are formed integrally with the oro-pharyngeal tube 1 and whereas said first suction tube 5 extends throughout a minor portion of the length of the oro-pharyngeal tube, the second suction tube 5' extends throughout the major portion of said oro-pharyngeal tube 1. A detachable closure plug (not shown) is provided for use with the distal end of either of the two suction tubes 5, 5' so that when one or other of the latter is in use, the remaining suction tube will be seated to atmosphere.

The provision of the pair of suction tubes 5, 5' ensures that if one such tube becomes blocked for any reason, the bulb 8 can quickly be removed from the blocked tube and fitted to the remaining suction tube, after the closure plug has been removed therefrom, to permit suction to continue.

Figure 7 shows yet another embodiment of the invention wherein it will be seen that the suction tube 5 extends only along a portion of the length of the oro-pharyngeal tube 1. However, it will be noted from Figure 7 that the primary tube 4 is provided, at a predetermined position along its length, with a flap valve 10 capable of pivoting about a pivot point 11 against the action of a bowed spring 12. The reason for the inclusion of this flap valve 10 which, it will be noted, only extends partially across the diameter of the primary tube 4, is that when considering the resuscitation of infants and children it is possible to use too much force in introducing air into the lungs or too much volume thereof, so much so, that there is a real danger of actually blowing out or rupturing a lung and this would be, as will be appreciated, an extremely dangerous complication. Therefore, by the provision of the valve 10, if the pressure of the air being blown into the airway is too great the flap valve 10 will be forced, against the action of the bowed spring 12, to extend partially across the diameter of the tube 4 and thereby substantially reduce the amount of pressure of air entering into the child's lungs. Whereas the suction tube 5 in this embodiment is shown as being similar to that of Figure 5, it will be appreciated that said suction tube may also take either of the forms shown in Figures 4 and 6.

Referring now to Figure 8 of the drawings which shows a still further modified form of apparatus, it will be seen that the oro-pharyngeal tube 1 and primary tube 4 are connected together by means of a flexible hose 13 suitably reinforced with a helical spring 14. The primary tube 4, adjacent the distal end of the device, is provided with a flap valve 15 which, when air is blown into said tube, is adapted to seat itself on the inner end of an outlet tube 22 formed in said primary tube 4.

Located in that portion of the primary tube 4 between the distal end thereof and the flexible hose 13 is an outlet 21 which leads to a stub tube 16

threaded at its lower end. The tube 16 has a correspondingly threaded cap 17 in engagement therewith, the latter being provided with a central orifice 18 and supporting a helical compression spring 19 which is seated thereon. As will be seen from Figure 8, the upper end of the helical spring 19 urges a ball valve 20 into engagement with the outlet 21 to resiliently close the latter.

As will be seen from reference to Figure 8, the inner periphery of the primary tube 4 is provided with a pair of projections 24, 25 located respectively upstream and downstream of the flap valve 15 which considerably restrict the flow, and hence the amount of air being blown into the distal end of the primary tube 4. It will also be noted that whereas the flap valve is of such dimensions as completely to close the outlet tube 22 when air is being blown into the resuscitator and completely to close the restricted opening existing between the upstream projection 24 and the inner periphery of the primary tube 4, its dimensions are such that it can never seal the restricted opening existing between the downstream projection 24 and said inner periphery of the primary tube 25. Moreover, a portion of the primary tube 4 located between said projections 24 and 25 is enlarged, as at 26, so as to form a venturi.

The suction tube 5 is capable of insertion into the oro-pharyngeal tube 1 adjacent to the mouth guard 2, but in this arrangement the bulb 8 is provided with a pair of axially aligned ball valves 23 each of which is seated on a helical compression spring.

The operation of the embodiment shown in Figure 8 is such that air is forcibly blown into the lungs of the victim through the proximal end of the device, and this pressure automatically urges the flap valve 15 into engagement with outlet tube 22 and effectively seals the latter. Of course, depending upon the victim, considering whether the latter be a child, medium or adult, the cap 17 can be threadably adjusted on the stub tube 16. This effects compression of the spring 19 which maintains the ball valve 20 in operative position. Thus, it will be seen that, depending upon the size and age of the victim, too great a force of air being blown into the device will effectively be controlled by the ball valve 20 lifting from its seating and permitting the said excess to escape to atmosphere. Moreover, the provision of the ball valve 20 effectively controls any excessive volume of air being blown into the victim's lungs. The exhaled air of the victim will pass up the oro-pharyngeal tube 1 and into the primary tube 4 and, due to the reverse direction of flow of air, the flap valve 15 will effectively seal off communication with the proximal end of the tube 4 by seating itself upon the upstream projection 24, and hence the air will escape to atmosphere through the outlet tube 22. Thus, it will be appreciated that the embodiment shown in Figure 8 does not permit the exhaled air of the victim to contaminate the mouth of the person applying the resuscitating, and the flap valve 15 effectively prevents regurgitated mucus, saliva or vomitus from reaching the operator's lips and lessens the likelihood of transfer of communicatable disease from victim to operator.

It is within the scope of the invention to omit the ball valve 16 shown in Figure 8 and to replace this with a diaphragm valve 27 shown in Figures 9 and 10 which, as it will be seen, is of smaller diameter than the diameter of the stub tube 16 and is provided with four diametrically opposed circumferential projections 28 normally adapted to abut the underside of the outlet 21.

The operation of the alternative form of pressure-reducing valve shown in Figures 9 and 10 is exactly the same as the type illustrated in Figure 8 and it can

be adjusted in a similar manner by means of the cap 17. However, when the pressure or volume of air is too great and the diaphragm valve 27 is urged away from its seating, the excess air will pass through the outlet 21, around the periphery of said valve 27 between the projections 28 and escape to atmosphere through the opening 18 in the cap 17. The method of resuscitating employed with the embodiments shown in Figures 2 to 10 is the same as that described above in connection with the type of device shown in Figure 1 with the exception that as the operator is blowing into the distal end of the primary tube 4, he is squeezing the aspirating or suction bulb 8 between each breath blown into the said tube. This serves to suck out any obstructing mucus, water or saliva which may have gathered in the victim's throat since the initial throat clearing has occurred.

It will be appreciated that in all cases, the corrugated portion of the oro-pharyngeal tube 1 will permit flexibility between the latter and the primary tube 4 thus permitting the victim to be at one angle and the person applying the method to be at another. This is an important factor where the victim may be pinned by debris such as in mining cave-ins or in otherwise inaccessible positions.

The oro-pharyngeal tube 1 is formed of rubber, either natural or artificial, as is the primary tube 4 and suction tube 5, to permit utmost relative flexibility of the components.

The oro-pharyngeal tube 1 may be of various sizes t accommodate use for children or adults but in each case, the distal end of the oro-pharyngeal tube 1 will be of a standard size to accommodate the tube 4.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A resuscitator comprising an air passage for blowing air into a patient's lungs, said passage being constituted by a primary tube and an oro-pharyngeal tube connected thereto, and at least one suction tube disposed at least in the oro-pharyngeal tube for removing mucus and secretions from the back of the patient's throat.

2. A resuscitator according to Claim 1 wherein said suction tube is coaxially disposed within said oro-pharyngeal tube and said primary tube and extends a predetermined amount from the outer end of the latter, said suction tube being capable of total withdrawal from said air passage.

3. A resuscitator according to Claim 1 wherein the suction tube is normally coaxially disposed within the air passage, and including a secondary tube incorporated in the oro-pharyngeal tube having its longitudinal axis arranged parallel with the longitudinal axis of said oro-pharyngeal tube, said secondary tube being capable of receiving said suction tube when the latter has been withdrawn from its normal coaxial position.

4. A resuscitator according to Claim 1 wherein a portion of the length of the suction tube is formed integrally with the oro-pharyngeal tube and extends throughout a minor portion of the length of the latter.

5. A resuscitator according to Claim 4 wherein a second suction tube is provided, said second suction tube being formed integrally with the oro-pharyngeal tube and extending throughout a major portion of the length of the latter.

6. A resuscitator according to Claim 1 wherein a portion of the length of said suction tube is normally coaxially disposed within the oro-pharyngeal tube and is capable of total withdrawal therefrom.

7. A resuscitator according to Claim 1 wherein a portion of the length of said suction tube is formed integrally with the oro-pharyngeal tube throughout a major portion of the length of the latter.

8. A resuscitator according to Claim 1 including a pressure-reducing valve disposed at a predetermined point along the length of the airway to prevent undue pressure of air from being blown into the victim's lungs.

9. A resuscitator according to Claim 8 wherein the valve is a flap valve pivoted to the inner periphery of the primary tube and including a spring for returning said flap valve to its inoperative position when the undue pressure of air has been relieved, said valve, when in its operative position substantially reducing the cross-sectional area of said primary tube.

10. A resuscitator according to Claim 8 wherein the valve is a ball valve, and including a seating in the inner periphery of the primary tube for said valve, a spring for resiliently urging said valve into engagement with said seating, a mounting for said spring, and means on said mounting and said primary tube whereby the amount of compression of said spring can be adjusted to suit various air pressures.

11. A resuscitator according to Claim 8 wherein the valve is a diaphragm valve, and including a seating in the inner periphery of the primary tube for said valve, a spring for resiliently urging said diaphragm valve into engagement with said seating, a mounting for said spring, and means on said mounting and said primary tube whereby the amount of compression of said spring can be adjusted to suit various air pressures.

12. A resuscitator according to Claim 1 including a non-return valve disposed in said airway and a cooperating outlet which permits expelled air of the victim to pass to atmosphere before reaching the distal end of said airway.

13. A resuscitator according to Claim 1 including a flexible connection between the primary tube and the oro-pharyngeal tube.

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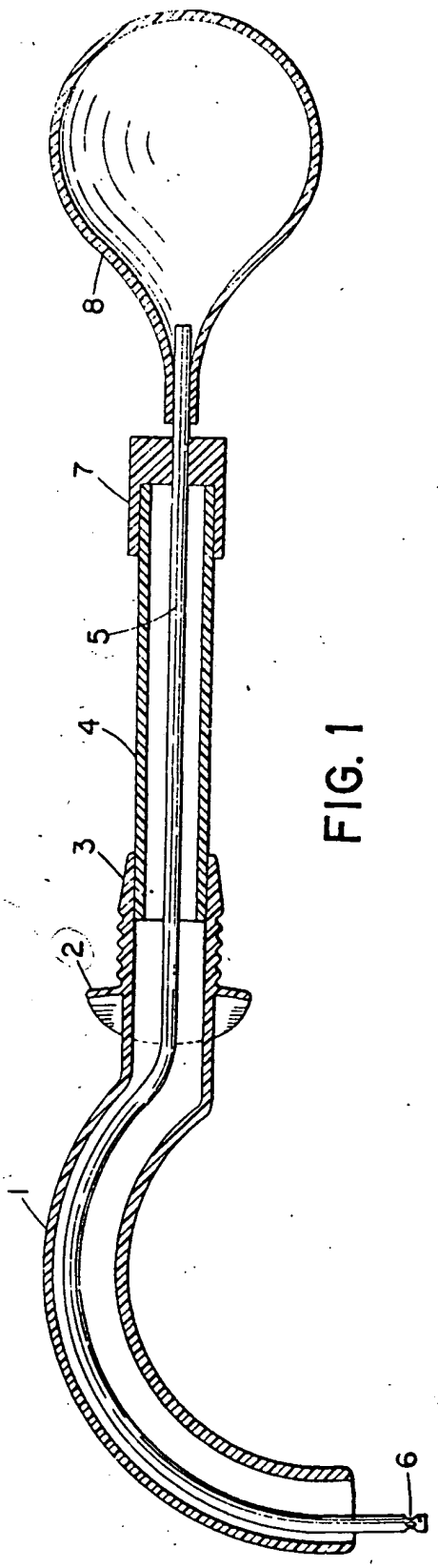

FIG. 1

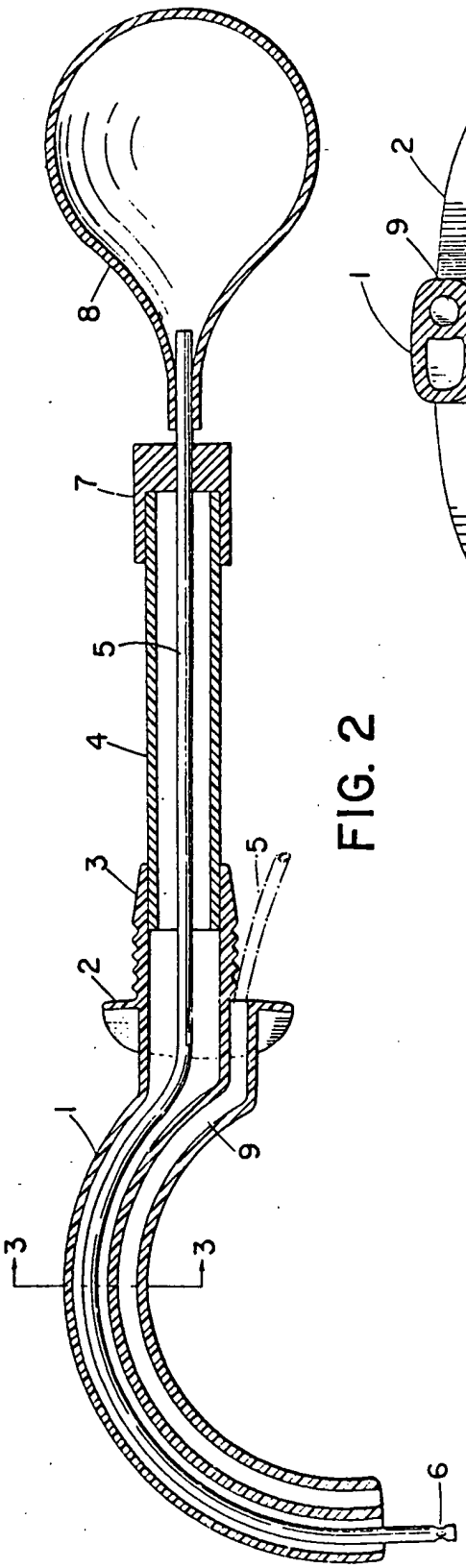

FIG. 2

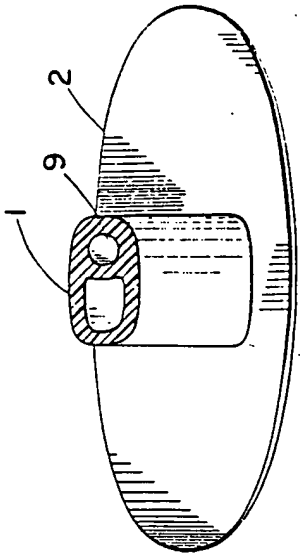

FIG. 3

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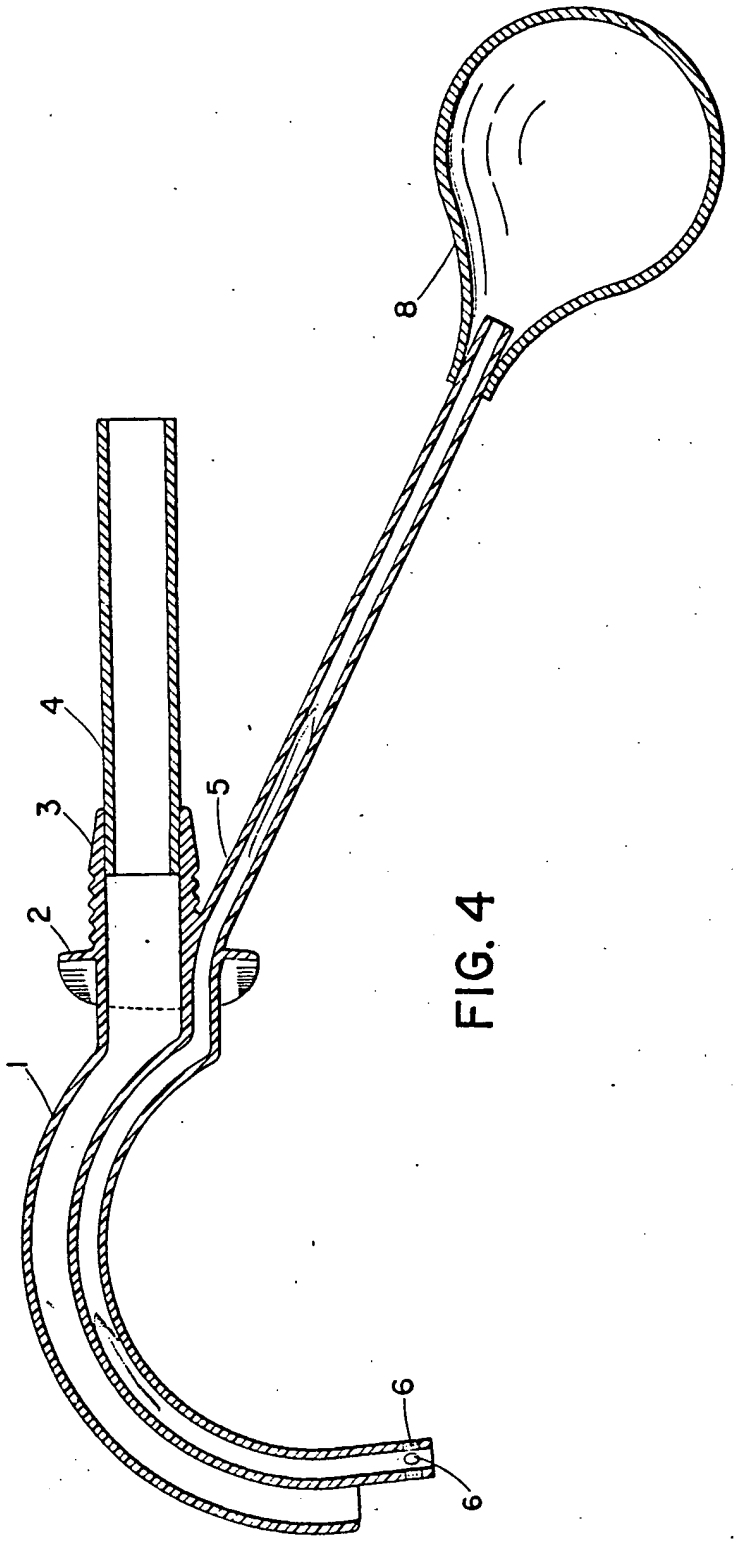

FIG. 4

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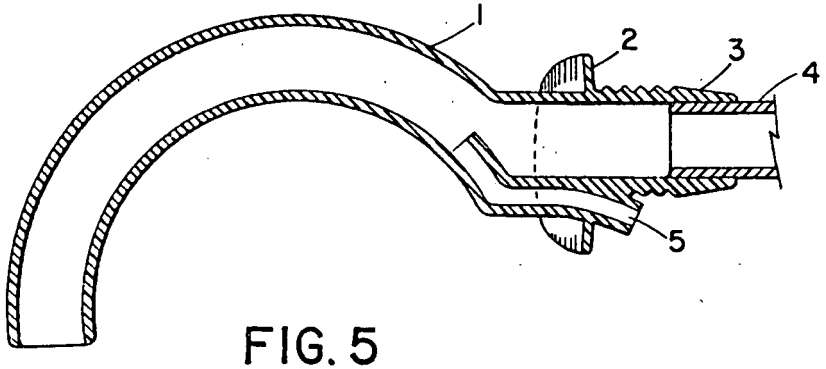

FIG. 5

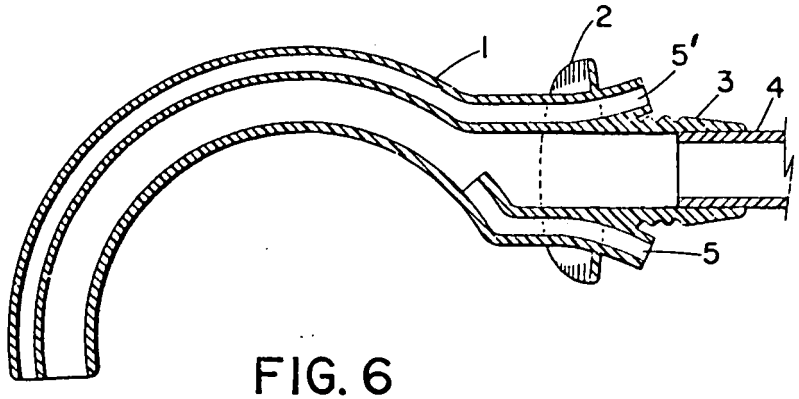

FIG. 6

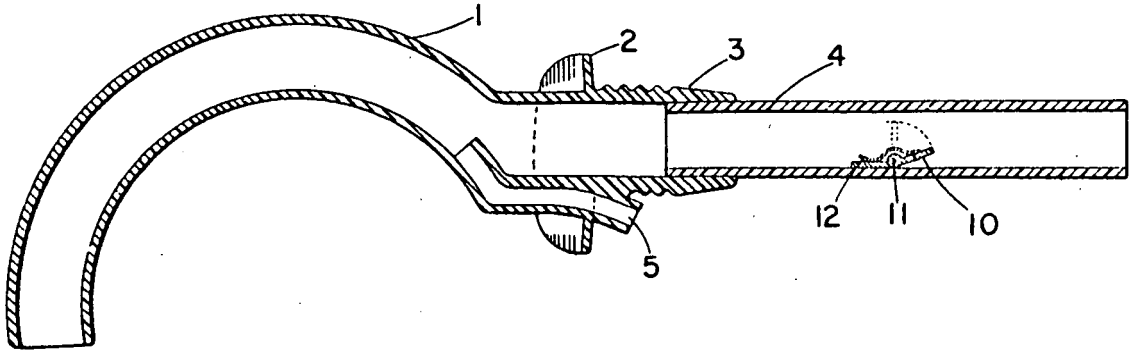

FIG. 7

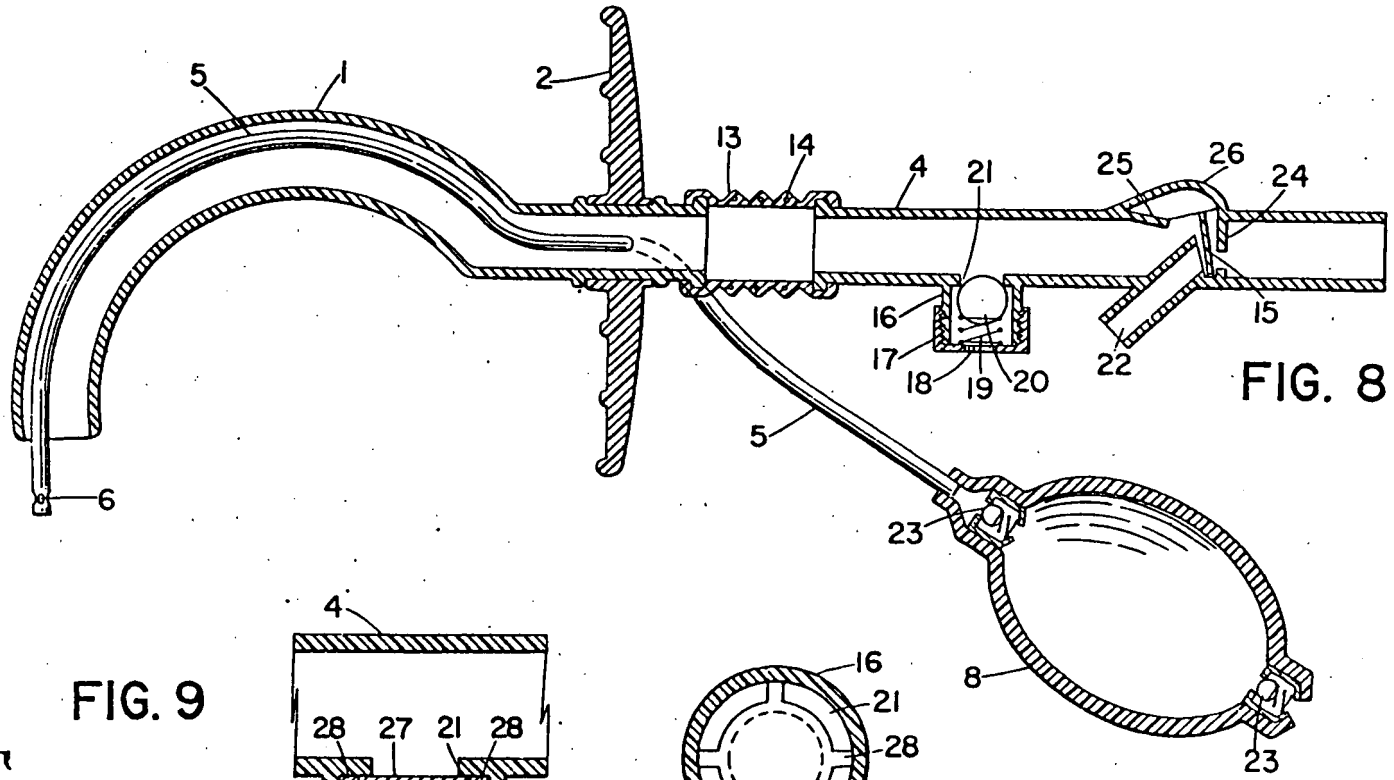

FIG. 8

FIG. 9

FIG. 10

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